4-13-1957

Test 611: McCormick Farmall 350 Gasoline

Tractor Test & Power Museum
University of Nebraska, jsteele4@unl.edu

The Experiment Station
University of Nebraska College of Agriculture
W. V. Lambert, Director, Lincoln, Nebraska

Department of Agricultural Engineering
Dates of test: April 1, 1957 to April 13, 1957
Manufacturer: INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILLINOIS
Manufacturer's rating: Not Rated

NEBRASKA TRACTOR TEST NO. 611

McCORMICK FARMALL 350

BELT HORSEPOWER TESTS

Hp	Crank shaft speed rpm	Fuel Consumption: Gal per hr	Fuel Consumption: Hp-hr per gal	Fuel Consumption: Lb per hp-hr	Temp. Deg. F.: Cooling medium	Temp. Deg. F.: Air wet bulb	Temp. Deg. F.: Air dry bulb	Barometer inches of mercury
TEST B—100% MAXIMUM LOAD—TWO HOURS								
40.71	1751	3.488	11.67	0.518	165	48	60	28.700
TEST C—OPERATING MAXIMUM LOAD—ONE HOUR								
39.31	1750	3.229	12.17	0.497	160	51	68	29.053
TEST D—RATED LOAD—ONE HOUR								
36.21	1751	3.105	11.66	0.519	153	58	60	28.613
TEST E—VARYING LOAD—TWO HOURS (20 minute runs; last line average)								
36.24	1751	3.090	11.73	0.516	153	59	62	.....
1.17	1925	1.195	0.98	6.179	192	59	62	.....
19.37	1871	2.183	8.87	0.681	189	65	67	.....
37.69	1675	3.125	12.06	0.501	161	61	63	.....
9.92	1906	1.647	6.02	1.004	191	59	61	.....
28.59	1842	2.728	10.48	0.577	149	53	58	.....
22.16	1828	2.328	9.52	0.635	172	59	62	28.665
TEST L—OPERATING MAXIMUM TORQUE								
% of rated rpm (engine)	100	95	90	85	80	75	70	65	60	55
% of rated-speed torque	100	102	104	105	108	111	113	115	114	112

DRAWBAR HORSEPOWER TESTS

Hp	Draw bar pull lbs	Speed miles per hr	Crank shaft speed rpm	Slip of drive wheels %	Fuel Consumption: Gal per hr	Fuel Consumption: Hp-hr per gal	Fuel Consumption: Lb per hp-hr	Temp. Deg. F.: Cooling med	Temp. Deg. F.: Air wet bulb	Temp. Deg. F.: Air dry bulb	Barometer inches of mercury
TEST H—RATED LOAD—TEN HOURS—3rd Gear											
28.76	2073	5.20	1751	3.29	2.854	10.08	0.600	162	36	44	29.091
TEST F—100% MAXIMUM LOAD											
37.54	2745	5.13	1747	4.44	3rd gear.....			155	43	54	28.980
TEST G—OPERATING MAXIMUM LOAD											
33.87	5439	2.34	1750	10.35	1st gear.....			163	50	59	28.770
35.56	3539	3.77	1750	5.54	2nd gear.....			165	46	54	28.810
35.79	2591	5.18	1751	3.67	3rd gear.....			145	44	51	28.820
35.76	2004	6.69	1749	2.75	4th gear.....			150	44	51	28.820
31.82	715	16.69	1750	0.70	5th gear.....			161	52	64	28.725
25.81	6457	1.50	1752	14.87	1st gear TA (prt-thrtl)			136	28	32	29.110
33.59	5167	2.44	1750	9.43	2nd gear torc amplifier.			160	50	59	28.770
35.08	3861	3.41	1751	6.21	3rd gear torc amplifier.			160	50	59	28.770
35.50	2998	4.44	1751	4.58	4th gear torc amplifier.			162	46	54	28.810
34.24	1147	11.20	1754	1.36	5th gear torc amplifier.			156	52	64	28.725
TEST J—OPERATING MAXIMUM LOAD											
34.57	2602	4.98	1748	7.62	3rd gear.....			167	54	71	28.670
TEST K—OPERATING MAXIMUM LOAD											
35.04	2878	4.57	1752	8.83	3rd gear.....			168	38	42	29.285

TIRES, WHEELS AND WEIGHT

	Tests F, G, & H	Test J	Test K
Rear wheels			
Type	Cast Iron	Cast Iron	Cast Iron
Liquid ballast	804 lb each	None	None
Added cast iron	700 lb each	None	None
Rear tires			
No. and size	Two 13.6-38	Two 13.6-38	Two 10-38
Ply	6	6	4
Air Pressure	20 lb	14 lb	14 lb
Front wheels			
Type	Cast Iron	Cast Iron	Cast Iron
Liquid ballast	None	None	None
Added cast iron	None	None	None
Front tires			
No. and size	Two 5.50-16	Two 5.50-16	Two 5.50-16
Ply	4	4	4
Air pressure	24 lb	24 lb	24 lb
Height of drawbar	18½ inches	19½ inches	16 inches
Static weight			
Rear end	6774 lb	3766 lb	3620 lb
Front end	1390 lb	1390 lb	1380 lb
Total weight as tested with operator	8339 lb	5331 lb	5175 lb

FUEL, OIL, WATER and TIME **Fuel** Gasoline **Octane No.** ASTM 82 **Research** 88 (rating taken from oil company's typical inspection data) **Weight per gallon** 6.048 lb **Oil** SAE 20-20W **To motor** 1.457 gal **Drained from motor** 1.148 gal **Water used** 0.163 gal **Total time motor was operated** 52 hours.

CHASSIS TYPE Tricycle **Serial No.** 1006 S **Tread width rear** 48" to 93" **front** 8⅛" to 16¾" **Wheel base** 92¼" **Hydraulic control system** direct engine drive **Advertised speeds mph** first 2.5 second 3.8 third 5.2 fourth 6.6 fifth 16.1 reverse 3.1 (using torque amplifier) first 1.7 second 2.6 third 3.5 fourth 4.5 fifth 10.9 reverse 2.1 **Belt pulley diam.** 9¾" **face** 7½" **rpm** 1081 **Belt speed** 2759 fpm **Belt** flat **Length** 72' **Width** 7" **Thickness** 0.216" **Maximum slip** 0.79% **Clutch** single plate dry disc operated by foot pedal **Seat** upholstered seat on conical spring with shock absorber **Brakes** double disc brakes operated by two foot pedals **Equalized** by locking pedals together **Power take-off** direct engine drive with independent clutch **Steering** hydraulically aided.

ENGINE **Make** International **Type** 4 cylinder vertical **Serial No.** C-175 2362 **Crankshaft** mounted lengthwise **Head** I **Lubrication** pressure **Bore and stroke** 3⅜" x 4¼" **Rated rpm** 1750 **Compression ratio** 7.0 to 1 **Displacement** 175 cu. in. **Port diameter valves Inlet** 1 23/64" **Exhaust** 1 7/32" **Governor** variable speed centrifugal **Carburetor size** 1¼" **Ignition system** battery **Starting system** 6 volt battery **Air cleaner** oil washed wire screen **Muffler** was used **Oil filter** replaceable treated paper element **Cooling medium temperature control** thermostat and radiator shutter.

REPAIRS AND ADJUSTMENTS No repairs or adjustments.

REMARKS All test results were determined from observed data and without allowances, additions or deductions. Tests B and F were made with carburetor set for 100% maximum belt horsepower and data from these tests were used in determining the horsepower to be developed in tests D and H, respectively. Tests C, D, E, G, H, J, K & L were made with an operating setting of the carburetor (selected by the manufacturer) of 96.1% of maximum belt horsepower.

HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60° F and 29.92" Hg)	38.53	42.44
2. Observed maximum horsepower (tests F and B)	37.54	40.71
3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (ASAE and SAE ratings)	28.90	36.07

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 611.

L. F. LARSEN
Engineer-in-Charge

L. W. HURLBUT (Chairman)
G. W. STEINBRUEGGE
J. J. SULEK
Board of Tractor Test Engineers

EXPLANATION OF TEST REPORT

TEST A: The manufacturer's representative operates the tractor for a minimum of 12 hours using light to heavy drawbar loads in each gear.

This serves as a period for limber up, general observation and adjustments. Adjustments that are permissable include valve tappet clearance, breaker point gap, spark plug gaps, clutch and others of a similar nature. No new parts or accessories can be installed without having mention made of it in the report.

No data are recorded during this preliminary run except the time that the engine is operated.

BELT HORSEPOWER TESTS

TEST B: The throttle valve is wide open and the belt load on the dynamometer is adjusted so that the engine is at the rated speed recommended by the manufacturer. Carburetor, ignition timing and manifold adjustments are all set for maximum engine power.

This test is designed to determine maximum belt horsepower of the tractor at rated speed and to measure fuel consumption at the maximum power on the belt.

TEST C: For tractors with carburetors the best fuel econonmy does not always occur when the engine develops maximum power at rated speed. Test C is intended to allow the manufacturer's representative to select a more economical fuel setting even though there is a slight loss of power. *This more practical carburetor setting is used in all later tests except test F.* The throttle valve is wide open and load adjusted to give rated rpm. Tests B and C are the same for diesel tractors which have an altogether different fuel system.

TEST D: The throttle control lever is set so that the governor will maintain rated engine speed when rated load is applied. Rated load is 85% of 100% maximum, as obtained in test B, corrected to standard conditions.

This rating is somewhat less than the maximum belt horsepower in order that the operator may have a certain amount of reserve.

TEST E:

Varying load serves to show the range of engine speeds when the engine is controlled by the governor during the following varied loads, of 20 minutes each; rated load, no load, ½ rated load, maximum load at wide open throttle valve, ¼ and ¾ rated load.

The average result of this test shows the average power and fuel consumption. Since the average tractor is subjected to varying loads, these data serve well in predicting fuel consumption and efficiency of a tractor in general use.

TEST L: This torque test is run with wide open throttle. Loads are applied to reduce engine speed in approximately ten 5% increments. Rated speed equals 100%. The corresponding dynamometer torque is recorded as a per cent of torque at rated speed.

DRAWBAR HORSEPOWER TESTS

In all drawbar tests the pull exerted by the tractor is transmitted by a hydraulic pressure cylinder to a recording instrument in the test car. When rubber tires are used, all tests are made on the concrete test course. All crawler type tractors are tested on a dirt test course which is maintained by grading, sprinkling and rolling so that it remains very nearly the same throughout the season. The same tires, wheels and weights are used for all tests except J and K.

TEST F: A drawbar test, the results of which are used to determine the rated drawbar horsepower in test H. The carburetor is set to develop maximum power as in test B. The rated gear recommended by manufacturer as plow gear is used in this test. The drawbar load is adjusted to give rated engine speed.

TEST G: Maximum drawbar horsepower is determined in each gear when the carburetor is set for fuel economy as in test C. The throttle valve is held wide open and the load is applied so that the engine runs at rated engine speed.

When operating in low gear it is not uncommon for the tractor to develop less drawbar horsepower than in rated gear because of excessive wheel slippage. When excessive wheel slippage occurs the load is reduced until slippage approaches 16%. When the load is reduced it is necessary to operate the tractor engine at part throttle and control engine speed by governor action.

TEST H: Intended to test the ability of the tractor to run continuously for 10 hours at rated drawbar horsepower and to determine the fuel consumption during that time. Rated drawbar horsepower is 75% of 100% maximum drawbar horsepower (Test F), corrected to standard conditions.

When operating at rated load the throttle control lever is set to maintain rated engine speed. This rating is less than maximum drawbar horsepower in order that the operator may have a certain amount of reserve.

TEST J: The tractor is operated in rated gear with all added weight removed. This test shows the effect of the removal of added weight on the performance of the tractor when compared with test G.

Removal of wheel weights generally increases wheel slippage and decreases drawbar horsepower.

TEST K: Similar to test J except that the smallest tires and lighest wheels offered by the manufacturer are used.